MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

TES3141 – EXPERT SYSTEMS

(All Sections / Groups)

5 OCTOBER 2015
2.30p.m. – 4.30p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 6 pages with 6 questions only.
2. Attempt **ALL** questions in PART A and choose only **ONE** question from PART B. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

PART A

QUESTION 1

(a) Knowledge can be classified into procedural knowledge, declarative knowledge, and tacit knowledge. Briefly explain and give an example for each of them.

[6 marks]

(b) Two sentences are logically equivalent if and only if they have the same truth value. Thus if A and B are any statements, the biconditional statement, $A \leftrightarrow B$, will be true in every case, giving a tautology.
Given the two sentences below:

> If you eat a banana split, then you cannot eat a pie.
> If you eat a pie, then you cannot eat a banana split.

i. Write the sentences using logical symbols. [1 mark]
ii. Write the truth table of the sentences. [2 marks]
iii. Determine whether their biconditional is a tautology. [1 mark]

Continued...

QUESTION 2

(a) Use the following to write quantified first-order predicate logic formulas: [5 marks]

P(x) = x is a programmer
S(x) = x is smart

i. All programmers are smart.
ii. Some programmers are smart.
iii. No programmers are smart.
iv. Someone is not a programmer.
v. Not everyone is a programmer.

(b) Given the following information:

```
IF    newspaper says today will rain
THEN  you can bring umbrella
CF_rule1=0.6

IF    radio says today will rain
THEN  you can bring umbrella
CF_rule2=0.8

Assuming that

CF (newspaper says today will rain)      = 0.5
CF (radio says today will rain)          = 0.7
```

Calculate

i) $CF_{rule1}(H,E1)$
ii) $CF_{rule2}(H,E2)$
iii) $CF_{combined}(CF_{rule1},CF_{rule2})$.

[5 marks]

Continued...

QUESTION 3

(a) Marie is getting married tomorrow, at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year (assuming 365 days per year). The probability that the weatherman forecasts rain is 0.09 given that it really rains, and the probability that the weatherman forecasts rain is 0.1 given that it actually does not rain.

Assuming
A = It rains on Marie's wedding.
B = The weatherman predicts rain.

Using Bayes' Theorem, determine the probability that it will rain given that the weatherman forecasts rain. [5 marks]

(c) Give a term that best matches each of the following. [5 marks]

i. _____ are the rules of thumb based on experience.
ii. _____ is the generation of a likely solution that is then used to if the proposed solution meets all requirements.
iii. _____ refers to the reasoning back from a true conclusion to the premises that may have caused the conclusion.
iv. _____ refers to a situation where the previous knowledge may be incorrect when a new evidence is obtained.
v. _____ method infers a conclusion based on the similarities to another situation.

Continued...

QUESTION 4

(a) Draw a frame system for cars. Consider their characteristics like name, manufacturer, year, specialization (a-kind-of / is-a), and owner. Include one instance with filled slots.

[5 marks]

(b) Given the rules:

Rule 1: IF *the proposal is submitted* THEN *the proposal will be approved.*

Rule 2: IF *the proposal is submitted* THEN *the proposal will not be approved.*

and assuming that:

p = proposal will be approved
f = proposal will not be approved
Θ = {p, f}

$m_1(p) = 0.7$ $m_1(\Theta) = 0.3$ for Rule 1
$m_2(f) = 0.6$ $m_2(\Theta) = 0.4$ for Rule 2

i) Produce the Dempster-Shafer table showing the combination of evidence.

ii) Calculate the combined mass (before normalization).

iii) Calculate κ.

iv) Calculate the combined mass (after normalization).

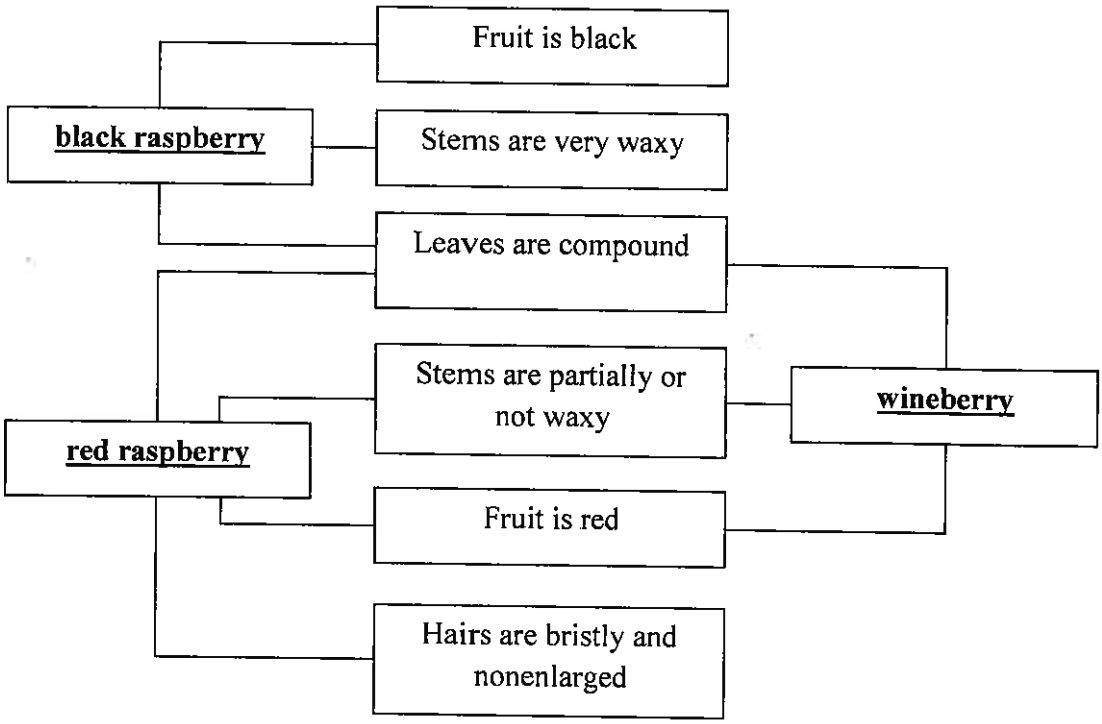
[5 marks]

Continued...

PART B

QUESTION 5

(a) Write IF-THEN rules to identify raspberries based on the figure shown below. [Note: *names of the raspberries are bold and underlined, the rest are characteristics*].



[5 marks]

(b) Differentiate between problem domain and knowledge domain. Give an example.

[5 marks]

QUESTION 6

(a) Name a disadvantage of semantic network. Draw links and nodes in a semantic network to describe elephant is a mammal. Jumbo and Domino are elephants.

[4 marks]

(b) Give three potential errors of expert systems development. [6 marks]

End of Paper